

**U.S. FISH AND WILDLIFE SERVICE
SPECIES ASSESSMENT AND LISTING PRIORITY ASSIGNMENT FORM**

SCIENTIFIC NAME: *Bidens micrantha* ssp. *ctenophylla*

COMMON NAME: Ko'oko'olau

LEAD REGION: Region 1

INFORMATION CURRENT AS OF: April 2010

STATUS/ACTION

☐ Species assessment - determined we do not have sufficient information on file to support a proposal to list the species and, therefore, it was not elevated to Candidate status

☐ New candidate

☒ Continuing candidate

☐ Non-petitioned

☒ Petitioned - Date petition received: May 11, 2004

☐ 90-day positive - FR date:

☒ 12-month warranted but precluded - FR date: May 11, 2005

☐ Did the petition request a reclassification of a listed species?

FOR PETITIONED CANDIDATE SPECIES:

a. Is listing warranted (if yes, see summary of threats below)? Yes

b. To date, has publication of a proposal to list been precluded by other higher priority listing actions? Yes

c. If the answer to a. and b. is "yes", provide an explanation of why the action is precluded.

Higher priority listing actions, including court-approved settlements, court-ordered and statutory deadlines for petition findings and listing determinations, emergency listing determinations, and responses to litigation, continue to preclude the proposed and final listing rules for the species. We continue to monitor populations and will change its status or implement an emergency listing if necessary. The "Progress on Revising the Lists" section of the current CNOR (<http://endangered.fws.gov/>) provides information on listing actions taken during the last 12 months.

☐ Listing priority change

Former LP: ☐

New LP: ☐

Date when the species first became a Candidate (as currently defined): February 28, 1996

☐ Candidate removal: Former LP: ☐

☐ A – Taxon is more abundant or widespread than previously believed or not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status.

- ___ U – Taxon not subject to the degree of threats sufficient to warrant issuance of a proposed listing or continuance of candidate status due, in part or totally, to conservation efforts that remove or reduce the threats to the species.
- ___ F – Range is no longer a U.S. territory.
- ___ I – Insufficient information exists on biological vulnerability and threats to support listing.
- ___ M – Taxon mistakenly included in past notice of review.
- ___ N – Taxon does not meet the Act’s definition of “species.”
- ___ X – Taxon believed to be extinct.

ANIMAL/PLANT GROUP AND FAMILY: Flowering plants, Asteraceae (Sunflower family)

HISTORICAL STATES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

CURRENT STATES/COUNTIES/TERRITORIES/COUNTRIES OF OCCURRENCE: Hawaii, island of Hawaii

LAND OWNERSHIP: There are four wild populations totaling fewer than 400 individuals on State, private, and Federal lands (Kaloko-Honokohau National Historic Park). There are three populations of propagated, outplanted plants, totaling 55 individuals, on Federal and State lands.

LEAD REGION CONTACT: Linda Belluomini, (503) 231- 6283, linda_belluomini @fws.gov

LEAD FIELD OFFICE CONTACT: Pacific Islands Fish and Wildlife Office, Christa Russell, 808-792-9400, christa_russell@fws.gov

BIOLOGICAL INFORMATION

Species Description

Bidens micrantha ssp. *ctenophylla* is an erect perennial herb, 1.6 to 5 feet (ft) (0.5 to 1.5 meters (m)) tall, and slightly woody at the base. The leaves are simple or occasionally trifoliate, 2.4 to 7.5 inches (in) (6 to 9 centimeters (cm)) long, with one to nine leaflets that are ovate-lanceolate, 1.4 to 5.3 in (3.5 to 13.5 cm) long, 0.2 to 2.2 in (0.5 to 6 cm) wide, and not ciliate on margins. Flower heads are small compound cymes, with five to nine rays per head that are 0.3 to 0.6 in (7 to 16 millimeters (mm)) long. Rays and corollas are yellow. The achenes are straight, awned, rarely winged, 0.2 to 0.6 in (5 to 14 mm) long, and 0.03 to 0.06 in (0.7 to 1.5 mm) wide, and glabrous (Ganders and Nagata 1999, pp. 278-279).

Taxonomy

Bidens micrantha ssp. *ctenophylla* was first described and recognized as a distinct subspecies by Ganders and Nagata (1999, pp. 278-279), in Wagner *et al.* (1999), the most recently accepted Hawaiian plant taxonomy.

Habitat/Life History

Bidens micrantha ssp. *ctenophylla* is found scattered on slopes, ridges, and cliffs in open mixed shrubland to dry *Metrosideros* (ohia) forest at elevations ranging from 600 to 2,080 ft (183 to 634 m). Typical habitat substrate is relatively recently deposited a'a lava. Commonly associated native species are: *Psydrax odorata* (alahee), *Myoporum sandwicense* (naio), *Reynoldsia sandwicensis* (ohe), and *Sophora chrysophylla* (mamane) (Ganders and Nagata 1999, pp. 278-279; Hawaii Biodiversity and Mapping Program (HBMP) 2008).

Historical Range/Distribution

Historically, *Bidens micrantha* ssp. *ctenophylla* is known only from the North Kona district on the island of Hawaii (HBMP 2008).

Current Range/Distribution

This subspecies is found on the dry leeward slopes of Hualalai volcano on the island of Hawaii (HBMP 2008).

Population Estimates/Status

This subspecies is now restricted to an area of less than 10 square-miles (26 square-kilometers). There are 4 wild and 3 outplanted populations totaling approximately 360 individuals. The majority of the wild individuals occurred in one area at Kealakehe (State-owned (Department of Hawaiian Home Lands (DHHL)), which now has very low numbers of individuals (K. Bio, Plant Extinction Prevention Program (PEP), pers. comm. 2008; HBMP 2008). A second large population at Kaloko has rapidly declined from almost 1,000 known individuals in 1992, to about 300 individuals (R. Boston, National Park Service (NPS), pers. comm. 2007; L. Pratt, U.S. Geological Survey-BRD, pers. comm. 2008; K. Bio, pers. comm. 2008; J. Zimpfer and C. Javar, U.S. Fish and Wildlife Service (Service), pers. comm. 2010). Five wild individuals exist on State land at Puu Waawaa Wildlife Sanctuary and are fenced (M. Donoho, Hawaii Division of Forestry and Wildlife (DOFAW), pers. comm. 2007). There are 3 outplanted populations, all of which are fenced: 5 individuals at Kipuka Owe owe, 1 individual at Koaia Tree Sanctuary, and 49 individuals at Kaloko-Honokohau National Historical Park (K. Kawakami, U.S. Army, pers. comm. 2007; R. Boston, NPS, pers. comm. 2007).

THREATS

A. The present or threatened destruction, modification, or curtailment of its habitat or range.

The largest population of *Bidens micrantha* ssp. *ctenophylla* occurs on private land that is threatened by urban development (M. Brueggemann, Service, pers. comm. 2007; HBMP 2008; J. Zimpfer and C. Javar, pers. comm. 2010).

B. Overutilization for commercial, recreational, scientific, or educational purposes.

None known.

C. Disease or predation.

None known.

D. The inadequacy of existing regulatory mechanisms.

Bidens micrantha ssp. *ctenophylla* is not currently protected under Hawaii's endangered species law (HRS, Sect. 195-D) or the Federal Endangered Species Act (16 U.S.C. §1531-1544).

E. Other natural or manmade factors affecting its continued existence.

Fire is a major threat to *Bidens micrantha* ssp. *ctenophylla* and is exacerbated by the presence of several introduced plant species such as *Pennisetum setaceum* (fountain grass) and *Leucana leucocephala* (koa haole) (HBMP 2008). Because Hawaiian plants were subjected to fire during their evolution only in areas of volcanic activity, or from occasional lightning strikes, they are not adapted to recurring fire regimes and do not quickly recover following a fire. Alien plants are often better adapted to fire than native plant species, and some fire-adapted grasses such as fountain grass have become widespread on the west side of the island of Hawaii, where *B. micrantha* ssp. *ctenophylla* occurs (D'Antonio and Vitousek 1992, pp. 64-65, 70-74; Friefelder *et al.* 1998, pp. 286-287). Native shrubland and dry forest can thus be converted to land dominated by alien grasses. The presence of such species in Hawaiian ecosystems greatly increases the intensity, extent, and frequency of fire, especially during the dryer months or periods of drought. Fire can destroy dormant seeds as well as plants, even in steep or inaccessible areas. Fires may result from natural causes, or they may be accidentally or intentionally started by humans (Cuddihy and Stone 1990, pp. 29-31; D'Antonio and Vitousek 1992, pp. 70-74; Friefelder *et al.* 1998, pp. 286-287).

In addition to fire, *Bidens micrantha* ssp. *ctenophylla* is threatened by alien plant species that degrade and destroy habitat and outcompete native plants (HBMP 2008). The nonnative plants that are reported to be the greatest threats to *B. micrantha* ssp. *ctenophylla* in the Kaloko Honokohau and Kealakehe population areas are: *Schinus terebinthifolius* (Christmas berry), *Pennisetum setaceum*, and *Leucana leucocephala* (HBMP 2008).

Leucana leucocephala is a naturalized shrub native to the Neotropics and cultivated for various purposes. It sometimes forms the dominant element of the vegetation in low elevation, dry, disturbed areas. *Leucana leucocephala* is an aggressive competitor that can fix nitrogen (Geesink *et al.* 1999, pp. 679-680).

Pennisetum setaceum, a grass native to northern Africa, was introduced to many areas as an ornamental, and is now naturalized in Hawaii. This grass is a serious pest in dry areas. It is an aggressive colonizer, and outcompetes most native species. *Pennisetum setaceum* is also fire-adapted, and burns swiftly and hot, causing extensive damage to the surrounding habitat (O'Connor 1999, p. 1,581).

Schinus terebinthifolius, a shrub native to Brazil, was introduced to Hawaii in 1911 and is now naturalized in mesic areas (Wagner *et al.* 1999, p. 198). It forms dense thickets and grows even on steep slopes, and the red berries are attractive to birds (Smith 1989, p. 63). Seedlings grow very slowly and can survive in dense shade, exhibiting vigorous growth if the canopy is cleared (growing at rates of 1 to 2 in (.03 to .05 m) per year) (Brazilian Pepper Task Force 1997), leading to the creation of open habitat, and further influencing and increasing its rate of spread. *Schinus terebinthifolius* is also a relative of poison ivy and may cause allergic skin reactions on sensitive persons. There are no released biocontrol agents to date (Brazilian Pepper Task Force 1997).

This species is included on the Hawaii noxious weed list (Hawaii Administrative Rules Title 4, Subtitle 6, Chapter 68).

The original native flora of Hawaii consisted of about 1,400 species, nearly 90 percent of which were endemic. Of the current total native and naturalized Hawaiian flora of 1,817 taxa, 47 percent are introduced species, and nearly 100 species are pests (Smith 1985, p. 180; Wagner *et al.* 1999, p. 45). Confirmed personal observations (HBMP 2008) and several studies (Cuddihy and Stone 1990, p. 74; Wood and Perlman 1997, pp. 6-7; Robichaux *et al.* 1998, p. 4) indicate nonnative plant species may outcompete native plants similar to *Bidens micrantha* ssp. *ctenophylla*. Competition may be for space, light, water, or nutrients, or there may be a chemical produced that inhibits growth of other plants (Smith 1985, pp. 227-230; Cuddihy and Stone 1990, p. 74). In addition, nonnative pest plants found in habitat similar to that of this species have been shown to make the habitat less suitable for native species (Smith 1985, pp. 240-241; Loope and Medeiros 1999, pp. 7-82; Medeiros *et al.* 1992, p. 30; Ellshoff *et al.* 1995, pp. ii, 3-4; Meyer and Florence 1996, p. 778; Medeiros *et al.* 1997, pp. 23-24; Loope *et al.* 2004, p. 1,472). In particular, alien pest plant species degrade habitat by modifying availability of light, altering soil-water regimes, modifying nutrient cycling, or altering fire characteristics of native plant communities (Smith 1985, pp. 227-230; Cuddihy and Stone 1990, p. 74; Vitousek *et al.* 1997, pp. 6-10). Because of demonstrated habitat modification and resource competition by nonnative plant species in habitat similar to the open mixed shrubland to dry *Metrosideros* forest habitat of *B. micrantha* ssp. *ctenophylla*, the Service believes nonnative plant species are a threat to this subspecies.

CONSERVATION MEASURES PLANNED OR IMPLEMENTED

One wild population at Puu Waawaa Wildlife Sanctuary, consisting of five individuals, is protected in an enclosure (M. Donoho, pers. comm. 2007; K. Kawakami, pers. comm. 2007). Outplanted populations are protected by fenced enclosures on State lands at Kipuka Owe owe (five individuals), and at Koaia Tree Sanctuary (one individual) (M. Donoho, pers. comm. 2007; K. Kawakami, pers. comm. 2007); and on Federal land at Kaloko-Honokohau National Park (approximately 49 individuals) (R. Boston, pers. comm. 2007). All of these populations have ongoing management efforts to reduce fountain grass (M. Donoho, pers. comm. 2007; K. Kawakami pers. comm. 2007; R. Boston, pers. comm. 2007). The remaining natural populations of this subspecies, numbering approximately 360 individuals on private and State lands are not currently protected or managed and are subject to development (M. Bruegmann, pers. comm. 2007; J. Zimpfer and C. Javar, pers. comm. 2010).

Bidens micrantha ssp. *ctenophylla* is represented in ex situ collections (B. Kiyabu, Amy Greenwell Botanical Garden, pers. comm. 2007; N. Sugii, Lyon Arboretum, pers. comm. 2006; P. Moriyasu, Volcano Rare Plant Facility, pers. comm. 2009; Service 2005).

SUMMARY OF THREATS

Based on our evaluation of habitat degradation and loss due to urban development, fire, and competition with nonnative plants, we conclude there is sufficient information to develop a proposed listing rule for this subspecies due to the present and threatened destruction, modification, or curtailment of its habitat and range, and the displacement of individuals of

Bidens micrantha ssp. *ctenophylla* due to competition with nonnative plants for space, nutrients, water, air, and light. Habitat loss due to urban development and fire are potential threats to *B. micrantha* ssp. *ctenophylla*. We find that this subspecies is warranted for listing throughout all its range, and, therefore, find that it is unnecessary to analyze whether it is threatened or endangered in a significant portion of its range.

RECOMMENDED CONSERVATION MEASURES:

- Protect populations from urban development
- Protect populations from fire
- Control alien plants
- Conduct/update field surveys at known locations and in suitable habitat
- Reintroduce individuals into suitable habitat within historic range that is being managed for known threats to this species
- Propagate and maintain genetic stock

LISTING PRIORITY

| THREAT | | | |
|-----------------|-----------------|------------------------------|-----------|
| Magnitude | Immediacy | Taxonomy | Priority |
| High | Imminent | Monotypic genus | 1 |
| | | Species | 2 |
| | | Subspecies/population | 3* |
| | Non-imminent | Monotypic genus | 4 |
| | | Species | 5 |
| | | Subspecies/population | 6 |
| Moderate to Low | Imminent | Monotypic genus | 7 |
| | | Species | 8 |
| | | Subspecies/population | 9 |
| | Non-imminent | Monotypic genus | 10 |
| | | Species | 11 |
| | | Subspecies/population | 12 |

Rationale for listing priority number:

Magnitude:

The largest population of this subspecies is highly threatened by urban development and all populations are threatened by fire and nonnative plants. Nonnative species add to the fuel load, replace native species after fire, and compete with *Bidens micrantha* ssp. *ctenophylla* for light, space, and nutrients. Threats to the mixed shrubland and dry forest habitats of *B. micrantha* ssp. *ctenophylla* occur throughout its range and are expected to continue or increase without

protection from urban development, fire, and control of nonnative weeds.

Immediacy of Threats:

Threats to *Bidens micrantha* ssp. *ctenophylla* from nonnative plants are considered imminent because they are ongoing. Urban development and fire are potential threats and are considered non-imminent.

Yes Have you promptly reviewed all of the information received regarding the species for the purpose of determining whether emergency listing is needed?

Is Emergency Listing Warranted? No. *Bidens micrantha* ssp. *ctenophylla* is currently known from four wild populations totaling approximately 360 individuals, with an additional 3 outplanted populations. This subspecies is threatened by urban development, fire, and competition with nonnative plants. The subspecies does not appear to be appropriate for emergency listing at this time because the immediacy of the threats is not so great as to imperil a significant proportion of the taxon within the time frame of the routine listing process. If it becomes apparent that the routine listing process is not sufficient to prevent large losses that may result in this subspecies' extinction, then the emergency rule process for this species will be initiated. We will continue to monitor the status of *B. micrantha* ssp. *ctenophylla* as new information becomes available. This review will determine if a change in status is warranted, including the need to make prompt use of emergency listing procedures.

DESCRIPTION OF MONITORING

Much of the information on this form is based on the results of a meeting of 20 botanical experts held by the Center for Plant Conservation in December of 1995, and was updated by personal communication in 2004 with the following species experts: Robert Hobdy, retired from the Hawaii Division of Forestry and Wildlife; Joel Lau, Hawaii Natural Heritage Program; Arthur Medeiros, U.S.G.S. Biological Resources Discipline; Hank Oppenheimer, resource manager for the Maui Land and Pineapple Company; and Steve Perlman and Ken Wood of the National Tropical Botanical Garden. We incorporated additional information on this species from our files and the most recent supplement to the *Manual of Flowering Plants of Hawaii* (Wagner and Herbst 2003). In 2005, we contacted the species experts, but received no new information on this taxon. New status information was provided in 2006 by Lyman Perry, Hawaii Division of Forestry and Wildlife, and Nellie Sugii of the Lyon Arboretum. New information was provided in 2007 by Mike Donoho (Puu Waawaa Coordinator, Hawaii Division of Forestry and Wildlife), Patty Moriyasu (Volcano Rare Plant Facility), Jill Wagner (Kaupulehu Dryland Forest Working Group), Richard Boston (National Park Service), and Brian Kiyabu (Amy Greenwell Botanical Garden), which was incorporated into this assessment. In 2008, we updated this form with information provided by Linda Pratt of the U.S. Geological Survey, Richard Boston, National Park Service, and Kealii Bio, Plant Extinction Prevention Program. In 2009 we received new information from Patrice Moriyasu, Volcano Rare Plant Facility. On February 9, 2010, we contacted the species experts listed below, but received no new information. We conducted surveys of the largest population in March 2010, and incorporated this new information.

List all experts contacted:

| Name | Date | Affiliation |
|---------------------|----------|--|
| Agorastos, Nick | 02/09/10 | Division of Forestry and Wildlife |
| Anderson, Stephen | 02/09/10 | National Park Service, Haleakala NP, Maui |
| Aruch, Sam | 02/09/10 | private contractor |
| Bakutis, Ane | 02/09/10 | Plant Extinction Prevention Program, Molokai |
| Ball, Donna | 02/09/10 | U.S. FWS, Partners Program, Hawaii Island |
| Beavers, Sally | 02/09/10 | National Park Service, Hawaii Island |
| Bily, Pat | 02/09/10 | The Nature Conservancy, Maui |
| Bio, Kealii | 02/09/10 | Plant Extinction Prevention Program, Hawaii Island |
| Brosius, Chris | 02/09/10 | West Maui Mountains Watershed Partnership |
| Caraway, Vickie | 02/09/10 | Hawaii Division of Forestry and Wildlife, Oahu |
| Ching, Susan | 02/09/10 | Plant Extinction Prevention Program, Oahu |
| Cole, Colleen | 02/09/10 | Three Mountain Alliance |
| Conry, Paul | 02/09/10 | Hawaii Division of Forestry and Wildlife |
| Coordinator | 02/09/10 | East Maui Watershed Partnership |
| Duvall, Fern | 02/09/10 | Hawaii Division of Forestry and Wildlife, Maui |
| Fay, Kerri | 02/09/10 | The Nature Conservancy, Maui |
| Garnett, Bill | 02/09/10 | National Park Service, Kalaupapa, Molokai |
| Giffin, Jon | 02/09/10 | The Nature Conservancy, Hawaii Island |
| Haus, Bill | 02/09/10 | National Park Service, Haleakala NP, Maui |
| Higashino, Jennifer | 02/09/10 | U.S. FWS, Maui |
| Imada, Clyde | 02/09/10 | Bishop Museum |
| Jacobi, Jim | 02/09/10 | U.S.G.S. Biological Resources Discipline |
| Kawakami, Galen | 02/09/10 | Division of Forestry and Wildlife, Kauai |
| Kawelo, Kapua | 02/09/10 | U.S. Army, Environmental Division |
| Kier, Matt | 02/09/10 | U.S. Army, Environmental Division |
| Kiyabu, Brian | 02/09/10 | Amy Greenwell Botanical Garden |
| Kraus, Jim | 02/09/10 | U.S. FWS, Hakalau NWR |
| Medeiros, Arthur | 02/09/10 | U.S.G.S. Biological Resources Discipline |
| Misaki, Ed | 02/09/10 | The Nature Conservancy, Molokai |
| Moriyasu, Patty | 02/09/10 | Volcano Rare Plant Facility, Hawaii Island |
| Moses, Wailana | 02/09/10 | The Nature Conservancy, Molokai |
| Nakai, Glynnis | 02/09/10 | U.S. FWS, Refuges, Maui |
| Oppenheimer, Hank | 02/09/10 | Plant Extinction Prevention Program, Maui Nui |
| Palomino, Anna | 02/09/10 | Olinda Rare Plant Nursery, Maui |
| Palumbo, David | 02/09/10 | National Park Service, Haleakala NP, Maui |
| Pepi, Vanessa | 02/09/10 | U.S. Navy, Environmental Contractor |
| Perlman, Steve | 02/09/10 | National Tropical Botanical Garden |
| Perry, Lyman | 02/09/10 | Division of Forestry and Wildlife, Hawaii Island |
| Plunkett, Bryan | 02/09/10 | Lanai Forest and Watershed Partnership |
| Pratt, Linda | 02/09/10 | U.S.G.S., Biological Resources Discipline |
| Purell, Melora | 02/09/10 | Kohala Watershed Partnership |
| Seidman, Stephanie | 02/09/10 | Maui Nui Botanical Garden |
| Shishido, Glenn | 02/09/10 | Division of Forestry and Wildlife, Maui |

| | | |
|-------------------|----------|--|
| Silbernagle, Mike | 02/09/10 | U.S. FWS, Refuges, Oahu |
| Smith, Miranda | 02/09/10 | Koolau Mountains Watershed Partnership |
| Starr, Forest | 02/09/10 | U.S.G.S. Biological Resources Discipline |
| Tanaka, Daniel | 02/09/10 | Puu Kukui Watershed Preserve |
| Ward, Joe | 02/09/10 | Puu Kukui Watershed Preserve |
| Welton, Patti | 02/09/10 | National Park Service, Maui |
| Wood, Ken | 02/09/10 | National Tropical Botanical Garden |
| Wysong, Michael | 02/09/10 | DLNR Natural Area Reserves, Kauai |

The Hawaii Biodiversity and Mapping Program identified this species as critically imperiled (HBMP 2006). *Bidens micrantha* ssp. *ctenophylla* is not included in the International Union for Conservation of Nature and Natural Resources Red List of Threatened Species. It is listed as a species of greatest conservation need in Hawaii's 2005 Comprehensive Wildlife Conservation Strategy (Mitchell *et al.* 2005, p. B1).

COORDINATION WITH STATES

On February 11, 2010, we provided the Hawaii Division of Forestry and Wildlife with copies of our most recent candidate assessments for their review and comment. No additional information or comments were received.

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- Zimpfer, J. and C. Javar, U.S. Fish and Wildlife Service, Kaloko Survey, March 2010.

APPROVAL/CONCURRENCE: Lead Regions must obtain written concurrence from all other Regions within the range of the species before recommending changes, including elevations or removals from candidate status and listing priority changes; the Regional Director must approve all such recommendations. The Director must concur on all resubmitted 12-month petition findings, additions or removal of species from candidate status, and listing priority changes.

Approve:

Acting Caryl A. Bohan 5/18/10
Regional Director, Region 1, Fish and Wildlife Service Date

Ronan W. Gould
ACTING
Director, Fish and Wildlife Service October 22, 2010

Concur:

Do not concur: _____ Date: _____
Director, Fish and Wildlife Service

Director's Remarks:

Date of annual review: _____ Date: April 6, 2010
Conducted by: Cheryl Phillipson, Pacific Islands FWO
Biologist, Prelisting and Listing Program

Comments:

PIFWO Review

Reviewed by: Christa Russell Date: April 19, 2010
Prelisting and Listing Program Coordinator

Marilet Zablan Date: April 26, 2010
Assistant Field Supervisor, Endangered Species Division

Gina Shultz Date: April 30, 2010
Acting Field Supervisor